

# Local Navigation in GNSS and Magnetometer-Denied Environments, Phase I

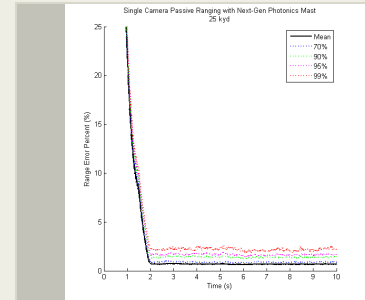
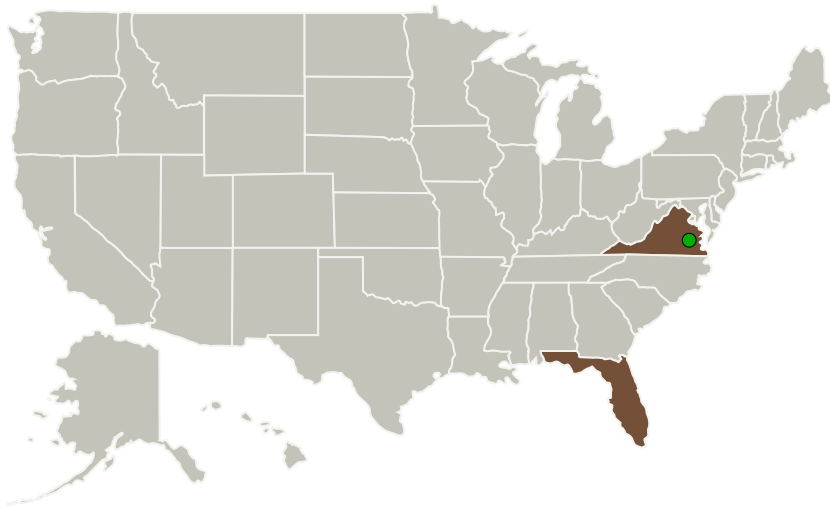
Completed Technology Project (2013 - 2014)



## Project Introduction

The proposed solution exploits recent advances in computer vision to conceive of a single-camera + gyro + accelerometer vision-based navigation solution such that the processing will be lightweight (requiring only a single optical flow sample per frame). Known landmarks (natural or artificial) will have absolute positions known to planetary exploration worker robots. The worker robot can identify its absolute position by observing known landmark features and deriving range from the raw attitude sensor data and the video stream. By observing one or more landmark features during camera motion, the position uncertainty of the range and bearing from the vehicle can be estimated. Each range / bearing measurement to known landmarks acts as a constraint for the camera position in the landmark navigation space (which may be arbitrarily defined and not oriented the same as the global navigation frame). Combining the worker's rough knowledge of its own position can further reduce the position error estimates. The single-camera passive ranging technology leverages Navy SBIR funded work for early simulation tasks.

## Primary U.S. Work Locations and Key Partners



Local Navigation in GNSS and Magnetometer-Denied Environments

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Organizations Performing Work	Role	Type	Location
Prioria, Inc.	Lead Organization	Industry	Gainesville, Florida
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia
University of Florida	Supporting Organization	Academia	Gainesville, Florida

## Primary U.S. Work Locations

Florida

Virginia

## Project Transitions

**May 2013:** Project Start**May 2014:** Closed out

## Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140721>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Prioria, Inc.

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

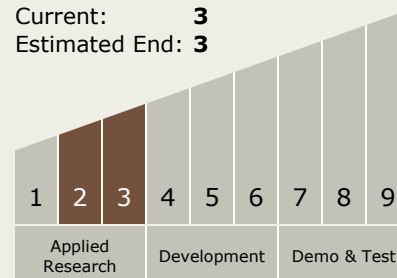
Walter L Hunt

## Technology Maturity (TRL)

Start: 2

Current: 3

Estimated End: 3

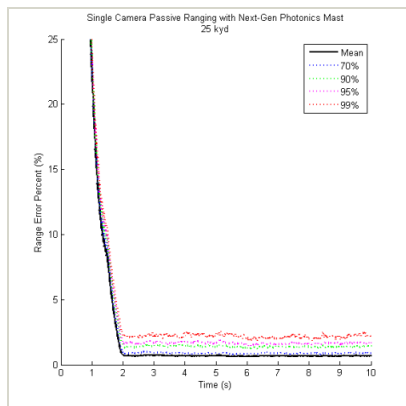


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## Images



### Project Image

Local Navigation in GNSS and  
Magnetometer-Denied  
Environments

(<https://techport.nasa.gov/image/128253>)

## Technology Areas

### Primary:

- TX04 Robotic Systems
  - └ TX04.1 Sensing and Perception
  - └ TX04.1.2 State Estimation

## Target Destinations

The Sun, Earth, The Moon,  
Mars, Others Inside the Solar  
System, Outside the Solar  
System